U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45226

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 79-41-594

STOUT SPORTSWEAR
QUEENS LONG ISLAND CITY, NEW YORK

May 1979

I. TOXICITY DETERMINATION

It has been determined, based on environmental and medical evidence that a hazard to the health of employees exposed to ammonia, toluene, xylene, perchloroethylene and naphtha distillates (C_9 - C_{11} alkanes) did not exist at Stout Sportswear, Queens Long Island City, New York. This was determined during a NIOSH Health Hazard Evaluation conducted onsite on January 23, 1979.

Environmental sampling to characterize personal and general area exposures to potential airborne contaminants revealed that the exposures to the previously mentioned substances were significantly below toxic concentrations. Some ammonia-induced irritation was reported to occur intermittently, a result consistent with occasional exposure to low level exposures.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are currently available upon request from NIOSH, Division of Technical Services, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service, (NTIS), Springfield, Virginia. Information regarding its availability through NTIS can be obtained from NIOSH, Publications Office at the Cincinnati address.

Copies of this report have been sent to:

a) Stout Sportswear, Queens Long Island City, New York
b) Authorized Employee Representative
c) International Ladies Garment Workers Union Local #10, N.Y., N.Y.
d) International Ladies Garment Workers Union, Washington, D.C.
e) U.S. Department of Labor - Region II
f) NIOSH, Region II

For the purpose of informing the approximately 19 "affected employees" the employer shall promptly "post" for a period of thirty calendar days, this Determination Report in a prominent place(s) near where exposed employees work.

III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6), authorizes the Secretary of Health, Education, and Welfare, following a written request by an employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The National Institute for Occupational Safety and Health (NIOSH) received such a request from an authorized employee representative regarding health problems resulting from airborne exposures to substances evolving from a clothing pattern copying ("photomaker") machine. The alleged health problems included headaches, pains, weakness, breathing difficulties and heart attacks.

NIOSH conducted a combined medical-environmental evaluation at the Company on January 23, 1979. An opening conference was first held with management and labor and then the facility and processes were reviewed. An Interim Report with findings and recommendations was sent to management and labor on January 24, 1979.

IV. HEALTH HAZARD EVALUATION

A. Facility Description

The facility is a four story brick building that previously housed a perfume factory. The main operations which began in 1973 are contained on the third floor which occupies approximately 18,000 square feet. The area has air conditioning for summer use and water radiators for heating. The oil burning boilers are situated in the basement. There are about seven exhaust fans equally spaced along the exterior walls. The fourth and first floors are used for shipping/receiving departments and the second floor is used for the distribution department.

B. Process Description

The process evaluated involved pattern making for women's sportswear for sizes 38-50. The job categories included officer personnel, photomakers, markers, graders and cutters. (See Table I for demography data). When a garment sample is received a pattern is developed to the particular specifications and the basic slope blocks. A draft pattern is made and a single garment is cut out, sewn, pressed and fit-tested on a live model. Appropriate corrections/ modifications are made until the right fit is obtained. Then from the basic pattern the other size patterns can be made. Multiple pattern sets can then

be made on a "lay table". Here the patterns are laid out over a plastic sheet and "run" paper is laid over it. The run paper contains a chemical which is light sensitive so when the lay table lights are turned on for a prescribed time the patterns' outline is photo copied onto the run paper. The run paper is then "developed"/copied on a photomaker machine for the master copies. The photomaker machine uses a solution called Super Diazol which is composed of primarily ammonium hydroxide. (This was the process which allegedly caused the health problems.) After copies of the patterns are made they can be laid out on long cutting tables, over laid with material (up to 100 layers depending on fabric density) and the patterns cut out. Cutting is performed with reciprocating electric cutters, both straight and disc. There are three cutting tables, one lay out phototable, one pattern table, and one automatic sizing table. The cut material is shipped to sewing facilities.

C. Environmental Evaluation

NIOSH scientists performed a combined environmental-medical survey and obtained information regarding the facility, processes, raw materials, and employee demography. A batch sample of the "photomaker" developing agent (Super Diozol) was obtained in a glass scintillation vial. Relative humidity and temperature measurements were made with a battery operated psychrometer and ventilation measurements were obtained with a Sierra* hot wire anemometer. Direct reading measurements for ammonia (NH_3), carbon monoxide (CO), carbon dioxide (CO_2), oxides of nitrogen (NO_x) formaldehyde (H_2CO), and sulfur dioxide (SO_2) were obtained throughout the area in the breathing zone of employees, using Drager* indicator tubes.

Personal and general area samples for airborne organic vapors were obtained utilizing both activated charcoal and silica gel tubes with calibrated battery pumps set at airflows of 0.05 and 0.2 liters per minute (lpm).[1] The pumps were hung on belts around the employees' waist and the adsorbent media tubes were hooked to their collars to obtain breathing zone exposures.

1. Environmental Sample Analysis

The charcoal and silica gel tubes were analyzed by desorbing the respective solid medias with 1 milliliter (ml) of carbon disulfide and 1 ml 0.1 n sulfuric acid. Aliquots of the desorption solution were analyzed by gas chromatography (GC) and mass spectrometry (MS).

The bulk sample of Super Diazol was extracted with methylene chloride, air dried and rediluted with methylene chloride. The solution was injected into the GC. Even direct injections into a GC with an "amine" column failed to isolate any detectable peaks.

*Use of Manufacturer's name does not constitute a NIOSH endorsement.

D. Medical Evaluation

NIOSH physicians interviewed all 19 employees via non-directive medical questionnaires. The results of the employee interviews (Table I) reveal that almost all employees complained of discomfort or annoyance associated with the odor of ammonia. Sixty-one percent (61%) (12 of the 19 workers) complained of health effects associated with ammonia inhalation. The distribution of complaints were: eye irritation 5; dry throat 5; cough 5; breathing difficulty 2; palpitations 1; dizziness 1; headaches 1; sore throat 1. Incidental medical problems included: hypertension 4; myocardial infarction 2; sinus problem 1; cancer of maxillary sinus 1; diabetes mellitus 1; shortness of breath 1.

E. Evaluation Criteria

1. Environmental Criteria

The following occupational single substance exposure criteria were used in evaluating the airborne environmental contaminants found at the time of the survey: (1) National Institute for Occupational Safety and Health (NIOSH), Recommended Criteria for Occupational Exposures, (2) American Conference of Governmental Industrial Hygienists (ACGIH), Threshold Limit Values (TLV) for Substances and Physical Agents in the Workroom Environment and supporting documentation, and (3) U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) Standards (29 CFR 1910.1000, Tables 21, 22 and 23). Tables II and III contain the criteria and standards for the substances identified.

These criteria are designed to protect most workers for an eight or ten hour work day, forty-hour work week, during a normal working lifetime. However, there are numerous factors that may influence an individual's response to a particular substance such as; age, sex, health status, smoking and alcohol habits, etc. Also, these criteria are based on single substance exposures; thus, effects from exposures to combinations of substances may be additive or synergistic when the substances elicit similar physiological responses.

2. Medical Criteria

"It appears that a standard of 50 ppm, expressed as a ceiling, will protect the worker from all adverse effects of long-term ammonia exposure, but epidemiological and experimental studies are needed for verification. Apparently, because of the excellent warning properties of ammonia and the general belief that workers will not remain in acutely hazardous concentrations,there has been little attention to the possibility of effects due to chronic low-level exposure."[3]

)ther than sensory effects -- either irritation or annoyance -- there is no evidence of acute or chronic adverse effects of ammonia exposure except after accidental exposure at extremely high concentrations, estimated in one fatal exposure to have been 10,000 ppm."[3]

F. Results and Discussion

1. Environmental

The results of the environmental evaluation are contained in Tables II and III. As the results indicate there are barely detectable concentrations of airborne contaminants in the work place and those which did exist were well below any potentially toxic level.

2. Medical

Workers expressed concern about the possible occurrence of adverse health effects stemming from long-term exposure to the developing solution. Exposure to developer is considered equivalent to ammonia exposure, and in worst case analysis has produced a NH_3 air concentration of 20 ppm (less than half the concentration considered safe by NIOSH).

The ammonia-induced irritation at these relatively low levels is undoubtedly disagreeable to workers, producing discomfort, annoyance, and worry about long-term health effects.

There have been few reports in the medical literature concerning the possibility of effects due to chronic low-level exposures. The relatively common medical conditions observed in this worker population are found in numbers not considered different from those expected in the general population. Further epidemiologic study of this population would be fruitless because of the small number of cases of commonly occurring conditions. While the levels found in the workplace are well within the recommended standard, prudence would dictate taking appropriate steps to reduce further unnecessary exposures.

IV. CONCLUSIONS/RECOMMENDATIONS

A. Conclusions

Based on the information obtained during the evaluation it is concluded that no health hazard exists for employees exposed to the trace levels of contaminants identified. Although individual susceptibility is an unmeasurable parameter and the low levels may be causing some perceived discomfort intermittently, the exposure levels are not believed to be a chronic health hazard.

B. Recommendations

The following recommendations are offered to help improve the health and safety conditions of the working environment:

1. The photocopying machine must be maintained in good working condition at all times and there should be a routine maintenance program which includes inspection of the local exhaust ventilation ducts, fan, motor, etc. The operator must be taught the proper procedures for start up, operations, and shut down. The exhaust fans should be turned on before start-up and shut off after shut down to help prevent airborne emissions.

2. The local exhaust ventilation system and the wall fan above the machine should have an exterior downward pointing elbow installed to help prevent the wind from blowing exhausted air back into the work area.

3. All precautions as listed on the Super Diazol drum lable must be strictly adhered to. This includes the wearing of safety goggles and impervious rubber gloves when handling the drums, particularly when changing over to a new drum. There should also be an eye wash bottle near this area in an easily accessible location for emergency use. Also there should be sufficient neutralizing/absorption material near-by and an approved NIOSH full face respirator with ammonia canisters available for emergencies such as large spills.

4. First aid procedures should be posted near the area. Ammonium hydroxide is a caustic alkaline chemical and all contact should be avoided. If contacted, the skin must be thoroughly rinsed with water to prevent chemical burns.

V. REFERENCES

1. NIOSH Manual of Sampling Data Sheets, DHEW (NIOSH) Publication No. 77-159, Cincinnati, Ohio 1977.

2. NIOSH Manual of Analytical Methods, Second Edition, Vol. 1-4, DHEW (NIOSH) Publication No. 77-157abc and 78-175, Cincinnati, Ohio, 1977, 1978.

3. NIOSH Criteria for a Recommended Standard...Occupational Exposure to Ammonia, DHEW (NIOSH) Publication No. 74-136, Cincinnati, Ohio, 1974.

4. NIOSH Criteria for a Recommended Standard...Occupational Exposure to Refined Petroleum Solvents, DHEW (NIOSH) Publication No. 77-192, Cincinnati, Ohio, 1977.

5. NIOSH Criteria for a Recommended Standard...Occupational Exposure to Tetrachloroethylene (Perchloroethylene), DHEW (NIOSH) Publication No. 76-185, Cincinnati, Ohio, 1976.

6. NIOSH Criteria for a Recommended Standard...Occupational Exposure to Toluene, DHEW (NIOSH) Publication No. HSM 73-11023, Cincinnati, Ohio, 1973.

7. NIOSH Criteria for a Recommended Standard...Occupational Exposure to Xylene, DHEW (NIOSH) Publication No. 75-168, Cincinnati, Ohio, 1975.

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Table I

Employee Demography

Stout Sportswear
Queens, New York
HE 79-41

January 23, 1979

	MALES		FEMALES		TOTAL	
Number of Employees	9		10		19	
Average Age (yrs.)	49.4		48.5		49	
Age Range (yrs.)	32-63		25-65		25-65	
Number of Smokers Presently	3	(33.3%)	3	(30%)	6	(32%)
Ex-Smokers	3	(33.3%)	2	(20%)	5	(26%)
Never Smoked	3	(33.3%)	5	(50%)	8	(42%)
Average length of Employment (years)	8.6		5.5			

TABLE II

Direct Reading Measurements

Stout Sportswear
Queens, New York
HE 79-41

January 23, 1979

Environmental Conditions: Indoors, 75°F, 12% Relative Humidity, 11:30 Hour

LOCATION	TIME	RESULTS (ppm)*					
		NH_3[1]	CO[2]	CO_2[3]	form[4]	NO_x[5]	SO_2[6]
Office	1300	N.D.	<5	<0.1%	N.D.**	N.D.	N.D.
Copying Machine	1145	<5	<5	<0.1%	N.D.	N.D.	N.D.
Sewing Area	1200	N.D.	<5	<0.1%	N.D.	N.D.	N.D.
Copy machine turned off - no fans	1210	7-10	<5	<0.1%	N.D.	N.D.	N.D.
Copying machine off-service, door open, fans off, ammonia flow on, barrel lines open	1215	20	<5	<0.1%	N.D.	N.D.	N.D.
ENVIRONMENTAL CRITERIA							
OSHA		50	50	0.5%	3	5	0.5
NIOSH		50	35	1.0%	1	1	5
ACGIH		25	50	0.5%	2	5	2

*Parts per million
**Not detected

1. ammonia
2. carbon monoxide
3. carbon dioxide
4. formaldehyde
5. oxides of nitrogen
6. sulfur dioxide

TABLE

Results of Sampling for Organic Vapors

Stout Sportswear
Queens, New York
HE 79-41

January 23, 1979

Environmental Conditions: Indoors, 75°F, 12% Relative Humidity, 11:30 Hour

SAMPLE NO.	TIME	DESCRIPTION	RESULTS (mg/M^3)*			
			Naptha[1]	Perchloroethylene	Xylene	Toluene
CT-1	1120-1440	Personal Sample (P.S.) Photomaker Machine Operator	< 5.0	< 0.5	< 0.5	< 0.5
SG-1[3]	1120-1440	P.S. Photomaker Machine Operator	--	--	--	--
CT-2	1121-1446	General Area (G.A.) Photomaker Machine Operator	<5.0	<0.5	<0.5	<0.5
CT-2[3]	1121-1446	G.A. Photomaker Machine Operator	--	--	--	--
CT-3	1129-1145	G.A. Sewing Area - Ironing	<5.0	<0.5	<0.5	<0.5
SG-3[3]	1129-1445	G.A. Sewing Area - Ironing	--	--	--	--
ENVIRONMENTAL CRITERIA						
OSHA			2000	670	435	750
NIOSH			350	339	434	375
ACGIH			1350	670	435	375

*Approximate milligrams per cubic meter air
1. C_9-C_{11} alkane solvent mixture
2. "<" denotes less than
3. Samples analyzed for amines - non-detected